Docket No. 2003-051-TAP

IMPROVED ROLLER GUIDE TAPE PATH

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates generally to data storage devices and particularly to an improved roller guide tape path within a data storage device.

2. Background of the Invention:

Magnetic tape is frequently used to store digital data. Such tape may be housed in a tape cartridge that protects the tape from damage. Tape drive systems for reading information from or writing information on magnetic tapes require tape guides to ensure that the tape is positioned correctly relative to the magnetic read/write heads in order to minimize lateral tape motion (LTM).

One type of prior tape path uses rollers having integral non-compliant fixed upper and lower flanges to guide the tape. Problems arising from this type of tape guide include friction generated from the tape movement against the fixed flanges which results in tape speed variations, tape resonance excitation, and tape debris generation. Also, the tape frequently varies in width, so that the flanges must be separated in excess of the tape width which results in vertical tape movement.

Magnetic tape may be made more useful and cost effective by increasing the density of information stored on the magnetic tape. One method of increasing

information density is to decrease the thickness of the tape thereby permitting more tape to be stored in a given volume.

Decreasing the thickness of magnetic tape creates difficulties in a tape transport system. Thinner tape more easily stretches, increasing the possibility of read and write errors. Thin tape is also susceptible to folding, kinking, creasing, curling and other mechanical damage. These difficulties are exacerbated by complex tape transport systems requiring rollers, guides, and the like to drive the tape and position the tape relative to the tape head.

Current storage device designs provide for a very compact housing for holding the tape guide mechanism. This requires a short tape path. A longer tape path is desirable to reduce lateral tape motion, reduce skew, reduce cross-web tension, and reduce loads on tape edges.

Therefore, the current technology would be improved by providing an improved roller guide tape path for use with thin tape so that a longer tape path may be provided in a compact housing for holding the tape guide mechanism.

SUMMARY OF THE INVENTION

A tape guide mechanism in a storage device is disclosed for defining an optimized roller guide tape path. A cartridge reel is provided for supplying tape to a take-up reel. Multiple flanged guides are provided located remotely from the cartridge and take-up reels and proximate to the read/write head(s). A non-flanged post guide is provided located proximate to the take-up reel for increasing the length of the tape path and for permitting the flanged guides to be located remotely from the cartridge and take-up reels so that the flanged guides are not located in proximity to the cartridge or take-up reels. An axis of symmetry exists longitudinally about one or two read/write heads. The tape path length is generally symmetrically disposed about this axis of symmetry.

The above as well as additional objectives, features, and advantages of the present invention will become apparent in the following detailed written description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a top view of a tape guide mechanism including an optimized roller guide tape path in accordance with the present invention; and

Figure 2 is a top view of the tape guide mechanism of **Figure 1** depicted using a two-axis coordinate system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention and its advantages are better understood by referring to the figures, like numerals being used for like and corresponding parts of the accompanying figures.

Figure 1 is a top view of a tape guide mechanism **100** including an optimized roller guide tape path in accordance with the present invention. **Figure 2** is a top view of tape guide mechanism **100** of **Figure 1** depicting preferred dimensions of the various components of the mechanism using a two-axis coordinate system in accordance with the present invention. The dimensions of the x-axis and y-axis depicted by **Figure 2** are in meters.

Referring to the figures, tape guide mechanism **100** includes a cartridge reel **102** for supplying tape to a drive reel **104**. The tape **106** travels in a tape path between reels **102** and **104**. The entire tape path extends from point **A** to point **G**.

The present invention describes a tape guide mechanism that defines a long tape path. Long length tape paths reduce lateral tape motion, reduce skew, reduce cross-web tension, and reduce loads on tape edges. Therefore, it is desirable to increase the length of the tape path. The design of the present invention permits use of as much of the housing as possible in order to maximize the length of the tape path.

Mechanism **100** includes a pair of read/write heads **108** and **110** for reading data from and writing data to tape **106** as it passes heads **108** and **110**. Alternatively,

a single read/write head may be used that is disposed along the axis **200** (see **Figure 2**).

A plurality of stationary guide rollers **112**, **114**, **116**, and **118** are provided for guiding tape **106** through the tape path. Guide rollers **112**, **114**, **116**, and **118** are preferably flanged and grooved. Rollers **112**, **114**, **116**, and **118** limit lateral tape motion, skew, and cross-web tension. Rollers **112**, **114**, **116**, and **118** provide friction with the tape back surface to keep rollers **112**, **114**, **116**, and **118** spinning at the tape's speed. This avoids wear on the tape edge and guide flanges. This friction also slows down lateral tape motion transients to an extent that the read/write heads **108** and **110** can follow the tape motions. The tape guides only contact the back side of the tape so that there is less damage to the data on the magnetic side of the tape.

A non-flanged stationary post guide **120** is also provided for extending the total length of the tape path. The inclusion of post guide **120** in mechanism **100** also permits guide rollers **112**, **114**, **116**, and **118** to be moved as far as possible from reels **104** and **102**. Post guide **120** is preferably a non-spinning guide.

The majority of the tape path, from points **B** to **G**, is symmetrically disposed about a longitudinal axis **200** forming a generally U-shaped path.

The generally U-shaped path provides a similar response regardless of the direction of tape travel. The tape path from point **B** to point **C** (tape path **B-C**) is generally parallel to both axis **200** and to the tape path from point **F** to point **G** (tape path **F-G**). The tape path

from point **D** to point **E** (tape path **D-E**) is generally perpendicular to axis **200**, and to the tape path **B-C** and the tape path **F-G**. Reels **102** and **104** may be moved so as to provide a more or less symmetrical path.

Rollers **116** and **118** and read/write head **110** are located in a first portion of tape mechanism **100** in positions that correspond to the positions of rollers **112** and **114** and read/write head **108** in the second portion of tape mechanism **100**.

Tape mechanism **100** will typically be housed within a housing (not shown) in a storage device. The housing is a finite size and a particular shape as determined by marketing requirements. The size and shape of the housing will limit the placement of the various rollers, guides, heads, and reels of the tape mechanism. According to the present invention, the addition of post guide **120** serves to lengthen the total tape path and may be positioned so that the tape path is nearly symmetrical in length about the pair of read/write heads **108** and **110**.

In this manner, flanged rollers **112**, **114**, **116**, and **118** may be located in the housing remotely as far away as possible from reels **104** and **102** in order to lengthen the tape path. Rollers **112**, **114**, **116**, and **118** are located close to read/write heads **108** and **110**. In particular, rollers **112** and **114** are located proximate to read/write head **108**, and rollers **116** and **118** are located proximate to read/write head **110**.

Rollers **112** and **118** are positioned to be as far away as specification limits on tape edge load will allow from adjacent rollers **114** and **118** respectively in order to

maximize lateral tape tracking performance. Rollers **114** and **116** should be positioned as closely as possible to heads **108** and **110**, respectively.

Any known flanged, preferably grooved, roller that is capable of spinning may be used to implement rollers **112**, **114**, **116**, and **118**. Any known non-flanged, guide may be used to implement guide **120**. Although a smooth, non-spinning guide, is preferred, a spinning guide may also be used.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.